

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS

1. (Original) A compound which comprises:

a metal (M) complex with an imido ligand (N-R) bound to the M to provide an M=N-R site, a carbon (C) bound to the M to provide an M=C reaction site, a substituted carbon or carbon and heteroatom (N,S,O) containing 1 to 12 carbon atoms which tethers the C of the M=C reaction site to the R of the M=N-R site, and two to four ligands (R') bound to the M to provide two to four M-R' sites;

wherein the M is selected from the group consisting of molybdenum and tungsten; the R and R' are each independently selected from the group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, and substituted cyclic; and, the R' can be interconnected.

2. (Original) The compound of Claim 1 wherein the R' are interconnected and each M-R' bond is between the M and an oxygen of a dialkoxide ligand or a nitrogen of an η^1 -pyrrolyl ligand.

3. (Original) The compound of Claim 2 wherein the η^1 -pyrrolyl ligand is N,N-di(pyrrolyl- α -methyl)-N-methylamine (dpma).

4. (Original) The compound of Claim 1 wherein the R' is 1,2-dimethoxyethane or 3,3'-di-tert-butyl-5,5',6,6'-tetramethyl-1,1'-biphenyl-2,2'-diol.

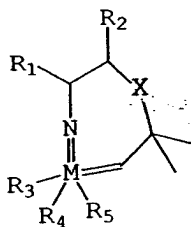
5. (Original) The compound of Claim 1 wherein the M is molybdenum.

6. (Original) The compound of Claim 1 wherein the substituted alkyl chain between the C of the M=C and the R of the M=N-R comprises a backbone of 1 to 12 carbon atoms.

7. (Original) The compound of Claim 1 wherein the substituted alkyl chain between the C of the M=C and the R of the M=N-R is $-\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}_2-$.

8. (Original) The compound of Claim 1 wherein the compound is immobilized on a solid support.

9. (Previously Presented) A compound of the formula



wherein M is a metal ion selected from the group consisting of Mo and W; wherein x is a carbon or carbon and heteroatom chain containing 1 to 12 carbon atoms; R₁ and R₂ can independently be selected from the group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, substituted cyclic, and hydrogen; R₁ and R₂ can be interconnected to each other; R₃, R₄, and R₅ can be independently be selected from the

group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, and substituted cyclic; R_3 , R_4 , and R_5 can be interconnected to each other; R_3 and R_4 can be interconnected to each other and R_5 can be absent; and R_3 and R_4 are separate and R_5 is absent.

10. (Original) The compound of Claim 9 wherein n is 2.

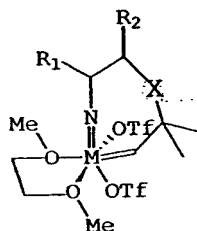
11. (Original) The compound of Claim 9 wherein R_1 and R_2 are adjacent carbons in an aromatic ring.

12. (Original) The compound of Claim 9 wherein M is molybdenum.

13. (Original) The compound of Claim 9 wherein the R_3 , R_4 , and R_5 are interconnected nitrogens of N,N -di(pyrrolyl- α -methyl)- N -methylaniline (dpma) and each of the bonds with the M is via a separate nitrogen of the dpma.

14. (Original) The compound of Claim 9 wherein the R_3 and R_4 are interconnected oxygens of a dialkoxide and each of the bonds with the M is via a separate oxygen of the dialkoxide.

15. (Previously Presented) A compound of the formula



wherein M is a metal ion selected from the group consisting of Mo and W; x is a carbon or carbon and heteroatom (N,O,S) containing 1 to 12 carbon atoms; OTf is a triflate; R_1 and R_2 can independently be selected from the group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, substituted cyclic, and hydrogen; and, R_1 and R_2 can be interconnected to each other.

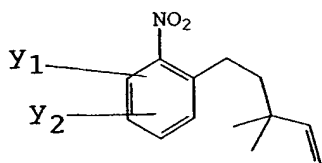
Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

16. (Currently Amended) The compound of Claim 15 wherein x is $-(CH_2)_2CH_2CH_2-$ $-C(CH_3)_2CH_2CH_2-$.

17. (Original) The compound of Claim 15 wherein R_1 and R_2 are adjacent carbons in an aromatic ring.

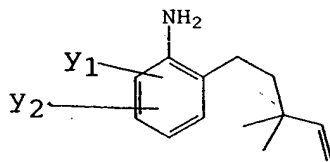
18. (Original) The compound of Claim 15 wherein M is molybdenum.

19. (Previously Presented) A compound of the formula



wherein y_1 and y_2 are each selected from the group consisting of hydrogen and lower alkyl containing 1 to 12 carbon atoms.

20. (Previously Presented) A compound of the formula

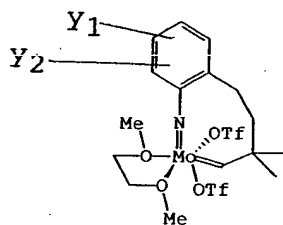


wherein y_1 and y_2 are each selected from the group consisting of hydrogen and lower alkyl containing 1 to 12 carbon atoms.

21. (Previously Presented) A compound of the formula $\text{MoCl}_2(\text{NAr})_2(\text{dme})$ wherein ArN is 2-(3,3-dimethyl-1-pentene)-1-phenyl-N= and dme is dimethoxymethane and the N is bound to the Mo via an imido bond.

22. (Previously Presented) A compound of the formula $\text{Mo}(\text{nph})_2(\text{NAr})_2$ wherein ArN is 2-(3,3-dimethyl-1-pentene)-1-phenyl-N= and nph is neophyl or neopentyl and the N is bound to the Mo via an imido bond.

23. (Previously Presented) A compound of the formula

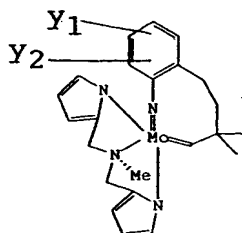


Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

wherein OTf is a triflate, and wherein y_1 and y_2 are each selected from the group consisting of hydrogen and lower alkyl containing 1 to 12 carbon atoms.

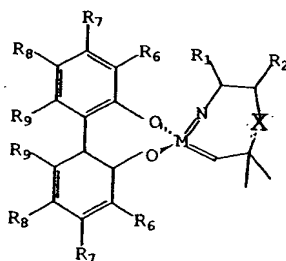
Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

24. (Previously Presented) A compound of the formula



wherein y_1 and y_2 are each selected from the group consisting of hydrogen and lower alkyl containing 1 to 12 carbon atoms.

25. (Original) A compound which has the structure



wherein M is a metal ion selected from the group consisting of Mo and W; x is a carbon group or a carbon and heteroatom (NOS) chain containing 1 to 12 carbon atoms; R_1 and R_2 can independently be selected from the

group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, substituted cyclic, and hydrogen; R_1 and R_2 can be interconnected to each other; R_6 , R_7 , R^8 , and R_9 can be independently be selected from the group consisting of hydrogen, alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, and substituted cyclic.

26. (Original) A process for metathesizing an olefin which comprises:

(a) contacting the olefin in a solvent with a metal (M) complex comprising an imido ligand (N-R) bound to the M to provide an M=N-R site, a carbon (C) bound to the M to provide an M=C reaction site, a substituted carbon or carbon and heteroatom (N,S,O) containing 1 to 12 carbon atoms which tethers the C of the M=C reaction site to the R of the M=N-R site, and two to four ligands (R') bound to the M to provide two to four M- R' sites;

wherein the M is selected from the group consisting of molybdenum and tungsten; the R and R' are each independently selected from the group consisting

Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, and substituted cyclic; and, the R' can be interconnected, to metathesize the olefin; and

(b) separating the metathesized olefin in the solvent from the catalyst.

27. (Original) The process of Claim 26 wherein the R' are interconnected and each M-R' bond is between the M and an oxygen of a dialkoxide ligand or a nitrogen of an η^1 -pyrrolyl ligand.

28. (Original) The process of Claim 27 wherein the η^1 -pyrrolyl ligand is N,N-di(pyrrolyl- α -methyl)-N-methylamine (dpma).

29. (Original) The process of Claim 26 wherein the R' is 1,2-dimethoxyethane or 3,3'-di-tert-butyl-5,5',6,6'-tetramethyl-1,1'-biphenyl-2,2'-diol.

30. (Original) The process of Claim 26 wherein the M is molybdenum.

Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

31. (Original) The process of Claim 26 wherein the chain between the C of the M=C and the R of the M=N-R comprises an alkylene backbone of 1 to 8 carbon atoms.

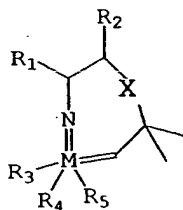
32. (Original) The process of Claim 26 wherein the chain between the C of the M=C and the R of the M=N-R is $-\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}_2-$

33. (Original) The process of Claim 26 wherein the catalyst is immobilized on a solid support.

34. (Original) The process of Claim 26 wherein the metathesis is selected from the group consisting of ring-closing metathesis and ring-opening cyclooligomerization metathesis.

35. (Original) A process for metathesizing an olefin which comprises:

(a) contacting the olefin in a solvent with a metal (M) catalyst which has the formula



wherein x is a carbon or carbon and heteroatom chain containing 1 to 12 carbon atoms; R_1 and R_2 can independently be selected from the group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, substituted cyclic, and hydrogen; R_1 and R_2 can be interconnected to each other; R_3 , R_4 , and R_5 can be independently be selected from the group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, and substituted cyclic; R_3 , R_4 , and R_5 can be interconnected to each other; R_3 and R_4 can be interconnected to each other and R_5 can be absent, and R_3 and R_4 can be separate from each other and R_5 is missing, to metathesize the olefin; and

(b) separating the metathesized olefin in the solvent from the catalyst.

36. (Original) The process of Claim 35 wherein n is 2.

37. (Original) The process of Claim 35 wherein R_1 and R_2 are adjacent carbons in an aromatic ring.

Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

38. (Original) The process of Claim 35 wherein M is molybdenum.

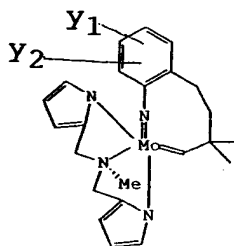
39. (Original) The process of Claim 35 wherein the R₃, R₄, and R₅ are interconnected nitrogens of N,N-di(pyrrolyl- α -methyl)-N-methylamine (dpma) and each of the bonds with the M is via a separate nitrogen of the dpma.

40. (Original) The process of Claim 35 wherein the R₃ and R₄ are interconnected oxygens of a dialkoxide and each of the bonds with the M is via a separate oxygen of the dialkoxide.

41. (Original) The process of Claim 35 wherein the catalyst is immobilized on a solid support.

42. (Original) The process of Claim 35 wherein the metathesis is selected from the group consisting of ring-closing metathesis and ring-opening cyclooligomerization metathesis.

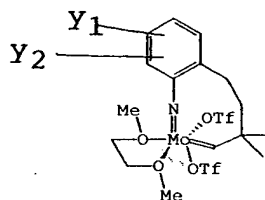
43. (Original) A process for preparing a molybdenum catalyst (I) of the formula



(I)

wherein y_1 and y_2 are each selected from the group consisting of hydrogen and lower alkyl containing 1 to 12 carbon atoms, which comprises:

reacting a compound (II) of the formula

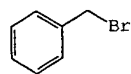


(II)

with N,N-di(pyrrolyl- α -methyl)-N-methylamine lithium salt to make the molybdenum catalyst (I).

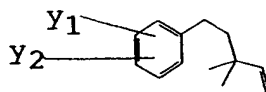
44. (Currently Amended) The process of Claim 43 wherein compound (II) is prepared by a process which comprises reacting a compound (III) of the formula

Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006



(III)

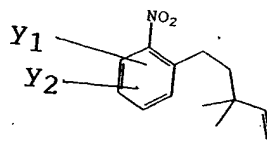
with 2-methyl-4-ZnBr-2-butene, to produce compound (IV)
having the formula



(IV)

;

reacting the compound (IV) with nitric acid/
acetic acid/ acetic anhydride to produce compound (V)
having the formula



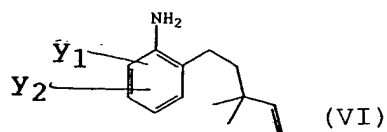
(V)

(V)

;

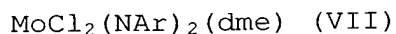
reacting compound (V) with SnCl_2 and an acid
to produce compound (VI) having the formula

Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006



;

reacting compound (VI) with dimolybdate, chlorotrimethylsilane, and triethylamine to produce compound (VII) having the formula



wherein Ar is aryl and dme is ~~dimethylethane~~ dimethoxymethane and the N is bound to the Mo via an imido bond;

reacting compound (VII) with neophyllyl (nph) MgCl to produce compound (VIII) having the formula



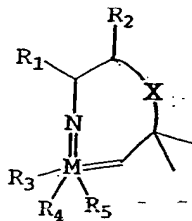
wherein Ar is aryl and nph is neophyllyl and the N is bound to the Mo via an imido bond; and,

reacting compound (VIII) with triflic acid in DME to produce the compound (II).

45. (Original) A process for the preparation of a Mo or W catalyst which comprises reacting a compound which comprises: a metal (M) complex with an imido ligand (N-R) bound to the M to provide an M=N-R site, a carbon (C) bound to the M to provide an M=C reaction site, a substituted carbon or carbon and heteroatom (N,S,O) containing 1 to 12 carbon atoms which tethers the C of the M=C reaction site to the R of the M=N-R site, and two to four ligands (R') bound to the M to provide two to four M-R' sites;

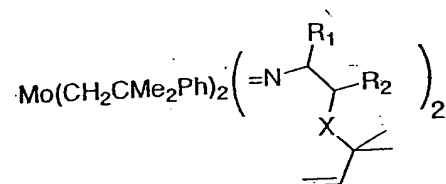
wherein the M is selected from the group consisting of molybdenum and tungsten; the R and R' are each independently selected from the group consisting of alkyl, heteroalkyl, substituted alkyl, aryl, heteroaryl, substituted aryl, cyclic, heterocyclic, and substituted cyclic; and the R' can be interconnected.

46. (Original) A process for the preparation of a M or W catalyst of the formula:



Attorney Docket No. MSU 4.1-643
Appln. Serial No. 10/691,328
Amendment dated January 3, 2007
Reply to Office Action dated August 15, 2006

which comprises reacting a compound



and a molar excess of triflic acid and dimethoxymethane
(DME) to form the catalyst.